

CLAIMS:

What is claimed is:

1 1. A method of producing a pre-alloyed stabilized zirconia powder comprising the
2 steps of:

3 alloying zirconia with a stabilizer selected from the group of yttria, ceria, magnesia,
4 ytterbia, scandia, dysprosia, neodymia, and calcia, the stabilizer being present in a quantity of
5 between about 5% and 25% relative to the zirconia by weight;

6 powderizing the alloyed stabilized zirconia;

7 spray-drying the stabilized zirconia powder to produce an agglomerated powder having
8 an average particle size suitable for use in spray coating applications.

9 2. The method of claim 1, wherein the stabilizer is yttria.

10 3. The method of claim 2, wherein the yttria is present in a quantity of between
11 about 6% and 10% relative to the zirconia.

12 4. The method of claim 3, wherein the yttria is present in a quantity of about 8%
13 relative to the zirconia.

14 5. The method of claim 1, wherein at least a substantial portion of the stabilized
15 zirconia powder comprises particles having a size of no more than about an order of magnitude
16 smaller than an average particle size of the agglomerated powder.

1 6. The method of claim 1, wherein the stabilized zirconia powder has an average
2 particle size of no more than about 10 microns.

1 7. The method of claim 6, wherein the agglomerated powder has an average particle
2 size in the range of between about 11 and 150 microns.

1 8. A pre-alloyed stabilized zirconia powder comprising generally spherical particles
2 with an average size of between about 11 and 150 microns, each particle comprising a plurality
3 of sub-particles held together by a binder, at least a portion of the sub-particles being alloyed
4 with a stabilizer selected from the group of yttria, ceria, magnesia, ytterbia, scandia, dysprosia
5 neodymia, and calcia, the stabilizer being present in a quantity of between about 5% and 25%
6 relative to the zirconia by weight.

9. The powder of claim 8, wherein the stabilizer is yttria.

1 10. The powder of claim 9, wherein the yttria is present in a quantity of between
2 about 6% and 10% relative to the zirconia.

1 11. The powder of claim 10, wherein the yttria is present in a quantity of about 8%
2 relative to the zirconia.

1 12. The powder of claim 8, wherein at least a substantial portion of the sub-particles
2 have a size of no more than about an order of magnitude smaller than an average particle size of
3 the agglomerated powder.

1 13. The powder of claim 8, wherein at least a substantial portion of the sub-particles
2 are no more than about 10 microns in size.

1 14. A method of producing a thermal barrier coating on a substrate comprising the
2 steps of :
3 providing a pre-alloyed stabilized zirconia powder comprising generally spherical
4 particles with an average size of between about 11 and 150 microns, each particle comprising a
5 plurality of sub-particles held together by a binder, at least a portion of the sub-particles being
6 alloyed with a stabilizer selected from the group of yttria, ceria, magnesia, ytterbia, scandia,
7 dysprosia neodymia, and calcia, the stabilizer being present in a quantity of between about 5%
8 and 25% relative to the zirconia by weight; and
9 applying the powder to the substrate using a thermal spray process.

1 15. A thermal barrier coating produced according to the method of claim 14.

1 16. The method of claim 14, wherein the stabilizer is yttria.

1 17. The method of claim 16, wherein the yttria is present in a quantity of between
2 about 6% and 10% relative to the zirconia.

1 18. The method of claim 17, wherein the yttria is present in a quantity of about 8%
2 relative to the zirconia.

1 19. The method of claim 14, wherein at least a substantial portion of the sub-particles
2 have a size of no more than about an order of magnitude smaller than an average particle size of
3 the agglomerated powder.

20. The method of claim 14, wherein at least a substantial portion of the sub-particles
are no more than about 10 microns in size.

21. A thermal barrier coating comprising:
zirconia alloyed with a stabilizer selected from the group of yttria, ceria, magnesia,
ytterbia, scandia, dysprosia, neodymia, and calcia, the stabilizer being present in a quantity of
between about 5% and 25% relative to the zirconia by weight;
the thermal barrier coating having a porosity of about 11% and a thermal conductivity
less than or equal to about 0.49 W/m-K at temperatures of at least 25°C.

1 22. The thermal barrier coating of claim 21, wherein the stabilizer is yttria.

1 23. The thermal barrier coating of claim 22, wherein the yttria is present in a quantity
2 of between about 6% and 10% relative to the zirconia.

1 24. The thermal barrier coating of claim 23, wherein the yttria is present in a quantity
2 of about 8% relative to the zirconia.

1 25. A thermal barrier coating comprising:
2 zirconia alloyed with yttria, the yttria being present in a quantity of about 8% relative to
3 the zirconia by weight;
4 the thermal barrier coating having a porosity of about 11% and a thermal conductivity
5 less than or equal to about 0.47 W/m-K at temperatures of at least 25°C.

6 26. The thermal barrier coating of claim 25, having a thermal conductivity of less
7 than or equal to about 0.43 W/m-K at temperatures between 500 and 1000 °C.

8 27. The thermal barrier coating of claim 25, having a thermal conductivity of between
9 about 0.47 W/m-K to about 0.375 W/m-K in a temperature range between 25 and 1000 °C.